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Dated 16 February 2009

Patents Form 1/77

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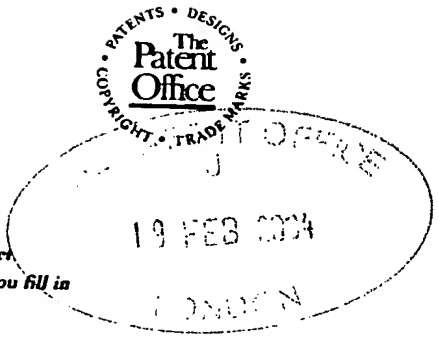

Request for grant of a patent

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1. Your reference 19 FEB 2004 JN/P9850GB

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P01/7700 0.00-0403719.8 CHEQUE

2. Patent application number
(The Patent Office will fill this part) 0403719.8

3. Full name, address and postcode of the or of each applicant *(underline all surnames)*

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Patents ADP number *(if you know it)* ~~8072225001~~ 8072225003

If the applicant is a corporate body, give the country/state of its incorporation United Kingdom

4. Title of the invention IMPROVEMENTS IN OR RELATING TO THE DEFEAT OF THE COPY PROTECTION OF OPTICAL DISCS

5. Name of your agent *(if you have one)* W. H. Beck, Greener & Co.

"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

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Patents ADP number *(if you know it)* 323001

6. Priority: Complete this section if you are declaring priority from one or more earlier patent applications, filed in the last 12 months.

Country	Priority application number *(if you know it)*	Date of filing *(day / month / year)*

7. Divisionals, etc: Complete this section only if this application is a divisional application or resulted from an entitlement dispute (see note f)

Number of earlier UK application	Date of filing *(day / month / year)*

8. Is a Patents Form 7/77 (Statement of inventorship and of right to grant of a patent) required in support of this request?

Answer YES if:

a) any applicant named in part 3 is not an inventor, or
b) there is an inventor who is not named as an applicant, or
c) any named applicant is a corporate body.

Otherwise answer NO (See note d)

Yes

Patents Form 1/77

9. Accompanying documents: A patent application must include a description of the invention. Not counting duplicates, please enter the number of pages of each item accompanying this form:

Continuation sheets of this form	
Description	13
Claim(s)	5
Abstract	
Drawing(s)	3

10. If you are also filing any of the following, state how many against each item.

Priority documents	
Translations of priority documents	
Statement of inventorship and right to grant of a patent (Patents Form 7/77)	
Request for a preliminary examination and search (Patents Form 9/77)	
Request for a substantive examination (Patents Form 10/77)	
Any other documents (please specify)	

11. I/We request the grant of a patent on the basis of this application.

Signature(s) WH Beck Greener & Co Date 19.02.04

12. Name, daytime telephone number and e-mail address, if any, of person to contact in the United Kingdom Mrs. J. Needle - (020) 7693 5600

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IMPROVEMENTS IN OR RELATING TO THE DEFEAT OF THE COPY PROTECTION OF OPTICAL DISCS

The present invention relates to a method of copying a copy protected optical disc and to apparatus for copying a copy protected optical disc.

The applicants' copending US application No. (Our Ref. P9849US, filed 19th February 2004) describes a technique for copy protecting an optical disc carrying information and control data. Thus, in this proposal, information is arranged on the optical disc in one or more content files and control data defines program paths which provide access to those content files, and at least one region which contains unreadable or subversive data is provided within the content files, and there are no program paths on the disc which provide access to the or each said region.

In such a method of copy protection, the unreadable or subversive data which has been provided on the disc does not interfere with any legitimate usage of the disc because there are no navigable paths in the programs on the disc which access the unreadable or subversive data. This means, therefore, that unreadable or subversive data which is particularly effective can be incorporated onto the disc to provide maximum copy protection.

The present invention seeks to provide methods to subvert such copy protection.

According to a first aspect of the present invention there is provided a method of copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, the method comprising the steps of:

accessing the information on the copy protected optical disc by utilising the program paths to access the content files,

storing the accessed information in corresponding content files, and

including arbitrary data in any content files corresponding to the regions which are not accessed by said program paths.

In this respect, if an attempt is made to copy the copy protected optical disc by extracting the data in the conventional linear manner, the unreadable or subversive data will either prevent the copying process or error correction or data recovery techniques utilised during copying will "correct" the data such that the subsequent copy disc is unplayable.

In embodiments of the present invention, the program paths can be utilised to ensure that the unreadable or subversive data is not accessed during the copying process.

In one embodiment of the present invention, the program paths are mapped to identify regions of the content files which are not accessed by the program paths. This copying method further comprises accessing the content files in a linear manner and storing the information therein, but avoiding accessing any region which has been identified as not accessed by program paths, and storing arbitrary data instead of the information in any content files corresponding to said identified regions.

In an alternative embodiment, the copying method comprises playing the disc whereby the information on the disc is accessed in a manner determined by the program paths, and storing the information retrieved from each accessed content file in a corresponding content file to build up an image of the information and control data on the disc.

In either embodiment, the stored information may be utilised to burn a copy disc.

Additionally and/or alternatively, the stored information may be provided as a stored disc image and simply stored, for example, on a user's computer for playing when required.

Generally, the content files on the disc are individual cells within a video object (VOB) file and are each accessed by respective pointers within an

information file (IFO). For example, the or each region of unreadable or subversive data is formed as an additional cell within a video object file, and the information file does not have pointers accessing the or each additional cell. Alternatively, the or each region of unreadable or subversive data is inserted within a video object file, and the information file does not have pointers accessing the or each said region.

In one embodiment, the arbitrary data included in said regions of the content files comprises sectors of zeros.

The present invention also extends to a method of copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, the method comprising the steps of:

reading the content files on the copy protected optical disc in a linear manner, and

storing the information in the content files in corresponding content files,

but, upon encountering a region of unreadable or subversive data, ceasing to read that region and storing arbitrary data in content files corresponding to said region.

If required, the method may comprise burning a disc from the stored information.

Generally, the content files are individual cells within a video object file, and are each accessed by respective pointers within an information file. For example, the or each region of unreadable or subversive data may be formed as one or more additional cells within a video object, and the information file does not have pointers accessing the or each additional cell. Alternatively, the or each region of unreadable or subversive data is inserted within the video object file, and wherein the information file does not have pointers accessing the or each said region.

Preferably, the arbitrary data included in said regions of the content files comprises sectors of zeros.

The present invention also extends to apparatus for copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, said apparatus comprising:

means for accessing the information on the disc by utilising the program paths to access the content files;

means for storing the accessed information in corresponding content files; and

means for incorporating arbitrary data into any content file corresponding to a region which is not accessed by said program paths.

In one embodiment, said means for accessing the information on the disc comprise means for mapping the program paths to identify regions of the content files which are not accessed by said program paths, and means for accessing the content files, which have not been identified as said regions, in a linear manner, and wherein said storage means is arranged to store the accessed information from the content files into corresponding content files, and to store arbitrary data into content files corresponding to said regions.

In an alternative embodiment, said means for accessing the information on the disc comprises means for receiving the output from an optical disc player, and wherein said means for storing is arranged to retrieve the information from each content file in the output and to store the retrieved information in corresponding content files whereby an image of the information and control data on the disc is stored.

The present invention also extends to apparatus for copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data

defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, the apparatus comprising:

means for reading the content files on the disc in a linear manner;

means for storing the information in the content files in corresponding content files;

means for halting reading by said reading means on encountering unreadable or subversive data in a region of the content files; and

means incorporating arbitrary data into a stored content file corresponding to said region.

Apparatus as defined above may additionally comprise means for burning the accessed information and the incorporated arbitrary data onto an optical disc.

Embodiments of the present invention will hereinafter be described, by way of example, with reference to the accompanying drawings, in which:

Figure 1a illustrates the structure of data on a DVD;

Figure 1b shows the structure within the program area of the disc of Figure 1a;

Figure 2 shows the structure of a video object file and a corresponding information file in a conventional DVD;

Figure 3 shows a view similar to that of Figure 2 but illustrating a copy protection technique;

Figures 4a to 4e show views similar to Figure 1b illustrating the copy protection of a DVD and a method of the invention to circumvent the copy protection; and

Figure 5 illustrates an apparatus for use in circumventing the copy protection of an optical disc.

The present invention is applicable to optical discs in general, but is described herein with reference to DVD formats. The invention is applicable to all DVD formats.

As is known to those skilled in the art, data is written to a DVD by appropriate mastering means in a bit stream to form pits and lands on the disc. In this respect, in a DVD writer the mastering means will generally be a laser beam recorder. Laser beam recorders are also used in mastering houses, but alternative mastering techniques are available and may be utilised.

As is well known, the pits extend along a spiral track on the surface of the disc and are separated by lands. Thus, the data on the DVD is arranged along the spiral track. As shown in Figure 1a, this data along the spiral track is arranged in a Lead-in 40, a program area 42 and a Lead-out 44.

The structure of the data on the DVD is the subject of standards, and is well known to those skilled in the art. Accordingly, only parts of the data structure which are relevant to the present invention are described and illustrated herein. As is indicated in Figure 1b, the program area 42 includes a volume descriptor 46 which identifies the structure and contents of the data in the program area 42. This volume descriptor 46 is followed by an information file (IFO) 48 which provides the syntax by which navigation to video object (VOB) files 50 is achieved. It will be seen that the information file 48 has pointers P which address the individual video objects 50. As is well known, each video object 50 contains an MPEG program stream which is made up of video, audio, and other content streams. The other content may comprise text and graphics, for example. A video object file 50 also includes information for controlling the presentation of the content of the file together with information enabling the data within the video object to be played in a forward or reverse direction at an accelerated rate.

Figure 2 shows the structure of a video object file and its corresponding information file and illustrates how, in a conventional DVD, a movie, for example, stored in a single video object file 50, can be accessed and navigated and thereby played.

In Figure 2, files from the information file 48 are shown. Not all of the connections and pointers between files in the information file 48 have been illustrated. Instead, Figure 2 illustrates how a single video object file 50 is addressed.

In the information file 48 there is a video title set 52 containing a collection of titles 54. Each title 54 includes one or more program chains 56. In general, only one program chain, say program chain x, addresses a single video object 50. In Figure 2, the title 54 "TITLE yy" addresses the chosen video object 50 and does so by way of program chain x. Each program chain 56 typically includes a number of individual programs as 58 which are arranged to be played in sequence. Each of the programs 58 has a pointer as 60. Typically, there is a single pointer 60 from each program 58 to a single corresponding video object 50, and each pointer 60 addresses a particular part of the corresponding video object file 50.

As is illustrated in Figure 2, each video object file 50 is divided into a number of individual cells 70. Typically, each of the programs 58 points, by way of its pointer 60, to an individual one of the cells 70 of the video object file 50. However, it is possible, as also indicated in Figure 2 for a single program 58, as program 1, to have two pointers 60 which address two contiguous cells 70. The arrangement is generally that, as the programs 58 are played in sequence by way of the relevant program chain 56, the cells 70 within the video object file 50 are similarly accessed in order.

Figure 3 shows an arrangement similar to that of Figure 2 except that the DVD illustrated in Figure 3 has been copy protected by a technique as described and claimed in the applicants' copending US application No. (our ref. P9849US, filed on 19th February 2004). It will be seen, by a comparison of Figures 2 and 3, that an additional cell 72 has been interposed between two cells 70 of the video object file 50. The additional cell 72 can be of any required size, but would generally be of a similar size to the size of the cells 70 in the video object file 50. As is also indicated in Figure 3, subversive data 74 has been incorporated within the additional cell 72 substantially centrally thereof. There is a buffer area 76 on either side of the subversive data 74 within the additional cell 72.

The subversive data 74 in the additional cell 72 of the video object file 50 may be any data which will stop a drive reading or playing an optical disc, and/or will stop the copying of data from the optical disc and/or will prevent the making of usable copies of the data on the disc. Examples of subversive data

which meet these requirements include data with incorrect error correcting codes, and information which has been deliberately altered. The data might be, or include, data patterns chosen to cause DSV problems, for example, data patterns chosen to ensure that the DSV has a significant absolute value and/or that the DSV has a rapid rate of change. A description of DSV data patterns and the problems they cause is given, for example, in WO 02/11136. It is additionally and/or alternatively possible to provide data which has mistimed waveform transitions.

In the main, it is expected that values of data, which may be information data and/or control data, will be changed during encoding of the data onto the optical disc whereby the subversive data is produced. However, it is additionally and/or alternatively possible to provide subversive data on the optical disc by mechanically or physically damaging bits or sectors of bits on the disc.

Examples of data which has been altered, and which can therefore provide subversive data for copy protecting a disc are described, for example, in WO 00/74053, WO 01/61695 and WO 01/61696.

Of course, when provided on an original disc, subversive data could cause problems for a drive seeking to play or otherwise use the optical disc for legitimate purposes. Accordingly, and as shown in Figure 3, steps are taken to ensure that during normal use of the optical disc 32, for example, during play by a drive, the subversive data 74 is never accessed. In this respect, and as illustrated in Figure 3, there are no pointers 60 pointing to the additional cell 72. It will also be appreciated, from a consideration of Figure 3, that if the programs 58 of program chain 56, for example, are run in sequence the drive will not navigate to the additional cell 72. In this way, the subversive data can be provided on the disc without any risk that it will subvert normal playing of the disc.

As set out above, there is a buffer area 76 on either side of the subversive data 74 within the additional cell 72. In this respect, some drives do read ahead when playing a disc. Thus, it may be that a drive which has been caused to access the first cell and then the second cell of the video file 50 may

look ahead to the next cell which, in the arrangement of Figure 3, would be the additional cell 72. To ensure that there is no risk that any such look ahead techniques would encounter the subversive data 74, the areas 76 of buffer data are provided. Generally, this data within the buffering zones 76 comprises pluralities of zeros.

Thus, it will be understood from the above that a DVD can be provided with subversive data as 74 without risk that that subversive data will adversely affect normal playing of the disc.

When an attempt is made to read data from the disc, rather than playing the video and audio content on the disc, the drive accesses all of the sectors on the disc in turn. It will be appreciated that to copy a DVD, commercially available drives arranged to copy DVDs seek to extract all of the data on the disc. Copying is, generally undertaken on a sector by sector basis. That is, the drive accesses each sector on the disc in a sequence to extract the data in that sector. Thus, during a copying operation, the drive will access the additional cell 72. It is possible that the subversive data 74 in the additional cell 72 will cause the read operation of the disc to fail. Alternatively, the subversive data may result in the generation of error flags which will mean that any copy that the drive is able to make will generally be unplayable.

Not only is it arranged that there is no navigation by way of the program files 58 to the additional cell 72, but no information about the existence or location of the cell is included in the information file 48. This could make it difficult for anyone trying to overcome the copy protection to find the subversive data.

As an alternative to the provision of subversive data in an additional cell 72, as described above, the subversive data may simply be inserted in a region of the video object file which is never accessed. For example, a region, as 72, of subversive data may be interposed between two adjacent cells 70. Alternatively, a region of subversive data may be inserted into existing cells or files. Where the subversive data is added to existing files, those files can be allowed to grow in size. Generally, no headers, control data, or structures are associated with such regions of subversive data. However, and as described

above, it is generally preferred that buffering zones are provided around the subversive data.

As set out above, the present invention seeks to circumvent the copy protection for an optical disc which has been described above.

As described above, the drives which can be controlled to extract the data from a disc, generally extract the data linearly on a sector by sector basis. In this eventuality, the drive is adversely affected by the subversive data in the additional cell or region 72.

It will be appreciated from a consideration of Figure 3, for example, that there are no pointers 60 pointing to the additional cell or region 72. One circumvention technique of the invention, therefore, searches the contents of the disc to map all possible navigable paths. This can be done, for example, by the use of an information file parser and interpreter. By mapping all of the program paths, it is then possible to identify areas on the disc which are not accessed by program paths. It is known that such areas, which are not accessed, will include the subversive data. Thereafter, the identified areas can be avoided during a copying procedure to enable all of the useful data to be obtained from the disc and all of the subversive data to be avoided.. Generally, an image of the data on the disc will be stored in memory. It may be advisable to store arbitrary data such as pluralities of zeros in any additional cells which have been identified as not addressed by program paths.

In an alternative approach, the data on the disc is read in a linear manner, but at a low level, for example, at the level of the bit stream, or before encoding, interleaving and scrambling of the data. If, on accessing any region, it is found that the region is unreadable or provides errors, that region is identified as one with subversive data and arbitrary data, such as a plurality of zeros, can be inserted in place of the subversive data in that region. In this way, an image of the data on the disc can be obtained.

Either of these techniques can be undertaken by appropriate software, the design of which will be within the competence of those skilled in the art.

It will be appreciated that the stored information and control data obtained from the copy protected disc by each of these techniques can be used to form a copy disc.

Figures 4a to 4e illustrate the copy protection of a DVD and another embodiment of a method of the invention able to circumvent the copy protection. Thus, Figure 4a shows an original unprotected DVD, as in Figure 1b, with an information file 48, video object files 50, and pointers P.

Figure 4b illustrates the interposition of a region of subversive data to provide a content file 150 which includes subversive data whereby the disc of Figure 4b is copy protected as described above.

If the disc of Figure 4b is copied by extracting the data sector by sector in a linear manner, as is usual, the data extracted may be somewhat as shown in Figure 4c in which the information file 48 and a first video object file 50 have been extracted but, the existence of the subversive data in the next region or content file 150 has caused the drive extracting the data to fail in its operation.

As shown in Figure 4d, an image of the disc as illustrated in Figure 4b can be obtained by a method of the present invention which is described further below with reference to Figure 5. In this method, the file 150, including the subversive data, is not accessed during extraction of data so that only the information file 48 and the useful video object files 50 are extracted from the disc.

The image built up of the disc can be burned onto a copy disc as indicated in Figure 4e. In the copy disc, the region 150 which was not accessed, has been filled with arbitrary data to create a file 160. For example, the data within the file 160 can, for example, be a plurality of zeros. In this respect, it will be appreciated that as with the disc shown in Figure 4b, the disc of Figure 4e does not, in use, provide for the file 160 to be accessed. The only requirement, therefore, for the arbitrary data to be incorporated in the file 160 is that it should not, itself, cause readability problems.

Figure 5 shows apparatus which may be used to obtain an image of a

copy protected disc as shown, for example, in Figure 4d and which may be used to provide a copy disc as shown in Figure 4e.

In the apparatus of Figure 5, a DVD reader 80 is provided for playing DVDs. In known manner the DVD reader outputs video and audio, which is fed via an MPEG decoding control unit 82 to display means 84. In this respect, the number of stages in the DVD player can be chosen as required and the stages may be provided by software, hardware or firmware. The information from the DVD, which is to be displayed by way of the display means 84, is fed to the display means 84 by way of an ATAPI bus which is indicated at 86. Commands associated with the information, either from the control unit 82, or from the data on the disc, are similarly applied to the bus 86.

The apparatus of Figure 5 includes a copying device 90, which may be rendered in software, hardware or firmware. The copying device 90 taps into the bus 86 to access both the information output from the DVD reader 80, that is, a movie, for example, and the associated commands sent to, and received from, the control unit 82. The device 90 then stores in memory 92 sector data and associated commands obtained from the DVD output on the bus 86. Specifically, the copying device 90 will be able to obtain the information from a sector on the disc and identify the number of that sector. In this way, the copying device 90 is able to build up an image of the disc as shown in Figure 4d. This image is stored in the memory 92. As described above, this stored image may then be used to produce a copy disc, as indicated in Figure 4e.

The copying technique described is able to copy the disc, even though it has been copy protected, because it looks at the information accessed by way of program paths and, thereby, does not access the subversive data. Thus, the copying technique works because the copy protection has been added to the disc in a way which does not interfere with the playing of the disc.

It will be appreciated that on a DVD there are often several titles and subtitles. For example, there may be a movie together with features about that movie, about personnel associated with the movie, out-takes and other additional material. It will be appreciated that a full copy of the disc, therefore, can only be made if the apparatus of Figure 5, for example, is made to play all

of the titles on the disc. It would be possible, of course, for the counterfeiter to run all of the options on a disc manually. However, in a preferred embodiment the copying apparatus 90 is programmed to command the MPEG decoding control unit 82 to cause all of the information on the DVD to be read without user intervention.

As previously, the image which is obtained on the disc, for example, the image as shown in Figure 4d can simply be saved. This stored disc image contains titles, for example, extracted from the DVD and can be utilised as if it were a physical disc whilst the device 90 remains connected to the bus 86. Thus, the stored disc image can be played upon receipt of commands from the control unit 82. Generally, however, it is to be expected that the region 160 will be filled with zeros, or other arbitrary data, and that the image would then be used to burn a DVD in the usual manner.

It will be appreciated that variations in, and amendments to, the invention as described and illustrated may be made within the scope of the appended claims.

CLAIMS

1. A method of copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, the method comprising the steps of:

accessing the information on the copy protected optical disc by utilising the program paths to access the content files,

storing the accessed information in corresponding content files, and

including arbitrary data in any regions of the corresponding content files which correspond to regions containing unreadable or subversive data.

2. A method of copying a copy protected optical disc as claimed in Claim 1, wherein the program paths are mapped to identify regions of the content files which are not accessed by said program paths, the copying method further comprising accessing the content files in a linear manner and storing the information therein, but avoiding accessing any region identified as not accessed by program paths and storing arbitrary data in place of the information in the corresponding content files.

3. A method of copying a copy protected optical disc as claimed in Claim 1, the copying method further comprising playing the disc whereby the information on the disc is accessed in a manner determined by the program paths, and storing the information retrieved from each accessed content file in a corresponding content file to build up an image of the information and control data on the disc.

4. A method of copying a copy protected optical disc as claimed in Claim 3, wherein the disc is played by an optical disc player to obtain the information on the disc, and wherein each content file in the output of the disc player is stored whereby an image of the information and control data on the disc is stored.

5. A method of copying a copy protected optical disc as claimed in Claim 4,

further comprising commanding the optical disc player to play all of the information on the disc such that the stored image of the disc is complete.

6. A method of copying a copy protected optical disc as claimed in any preceding claim, further comprising burning a disc from the stored information.

7. A method of copying a copy protected optical disc as claimed in any preceding claim, wherein the content files are individual cells within a video object (VOB) and are each accessed by respective pointers within an information file (IFO).

8. A method of copying a copy protected optical disc as claimed in Claim 6, wherein the or each region of unreadable or subversive data is formed as one or more additional cells within a video object file, and wherein the information file does not have pointers accessing the or each additional cell.

9. A method of copying a copy protected optical disc as claimed in Claim 6, wherein the or each region of unreadable or subversive data is inserted within the video object file, and wherein the information file does not have pointers accessing the or each said region.

10. A method of copying a copy protected optical disc as claimed in any preceding claim, wherein the arbitrary data included in said regions of the content files comprises sectors of zeros.

11. A method of copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, the method comprising the steps of:

reading the content files on the copy protected optical disc in a linear manner, and

storing the information in the content files in corresponding content files, but, upon encountering a region of unreadable or subversive data,

ceasing to read that region and storing arbitrary data in content files corresponding to said region.

12. A method of copying a copy protected optical disc as claimed in Claim 11, further comprising burning a disc from the stored information.

13. A method of copying a copy protected optical disc as claimed in Claim 11 or Claim 12, wherein the content files are individual cells within a video object (VOB) file and are each accessed by respective pointers within an information file (IFO).

14. A method of copying a copy protected optical disc as claimed in Claim 13, wherein the or each region of unreadable or subversive data is formed as one or more additional cells within a video object file, and wherein the information file does not have pointers accessing the or each additional cell.

15. A method of copying a copy protected optical disc as claimed in Claim 13, wherein the or each region of unreadable or subversive data is inserted within the video object file, and wherein the information file does not have pointers accessing the or each said region.

16. A method of copying a copy protected optical disc as claimed in any of Claims 11 to 15, wherein the arbitrary data included in said regions of the content files comprises sectors of zeros.

17. Apparatus for copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, said apparatus comprising:

means for accessing the information on the disc by utilising the program paths to access the content files;

means for storing the accessed information in corresponding content files; and

means for incorporating arbitrary data into any regions of the corresponding content file which correspond to regions containing unreadable or subversive data.

18. Apparatus for copying a copy protected optical disc as claimed in Claim 17, wherein said means for accessing the information on the disc comprise means for mapping the program paths to identify regions of the content files which are not accessed by said program paths, and means for accessing the content files, which have not been identified as said regions, in a linear manner, and wherein said storage means is arranged to store the accessed information from the content files into corresponding content files, and to store arbitrary data into said regions of the corresponding content files.

19. Apparatus for copying a copy protected optical disc as claimed in Claim 18, wherein said means for accessing the information on the disc comprises means for receiving the output from an optical disc player, and wherein said means for storing is arranged to retrieve the information from each content file in the output and to store the retrieved information in corresponding content files whereby an image of the information and control data on the disc is stored.

20. Apparatus for copying a copy protected optical disc as claimed in Claim 19, further comprising means for commanding the optical disc player to play all of the information on the disc such that the stored image of the disc is complete.

21. Apparatus for copying a copy protected optical disc, the optical disc carrying information and control data, the information being arranged in one or more content files, and the control data defining program paths providing access to the content files, wherein at least one region which contains unreadable or subversive data is provided within the content files, and wherein there are no program paths on the disc which provide access to the or each region of unreadable or subversive data, the apparatus comprising:

means for reading the content files on the disc in a linear manner;

means for storing the information in the content files in corresponding content files;

means for halting reading by said reading means on encountering

unreadable or subversive data in a region of the content files; and

means incorporating arbitrary data into regions of said corresponding content files which correspond to said region.

22. Apparatus for copying a copy protected optical disc as claimed in any of Claims 17 to 21, further comprising means for burning the accessed information and arbitrary data onto an optical disc.

23. A method of copying a copy protected optical disc substantially as hereinbefore described with reference to the accompanying drawings.

24. Apparatus for copying a copy protected optical disc substantially as hereinbefore described with reference to the accompanying drawings.

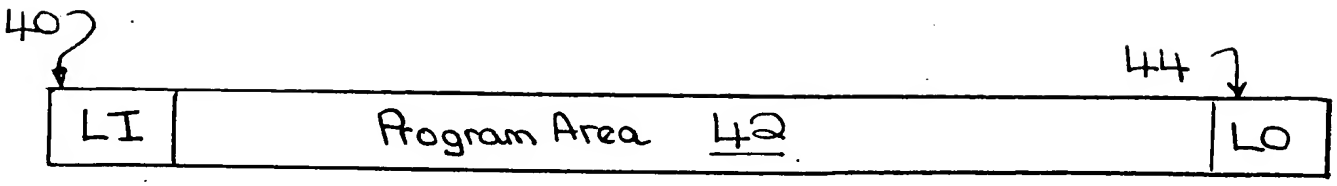

Figure 1a

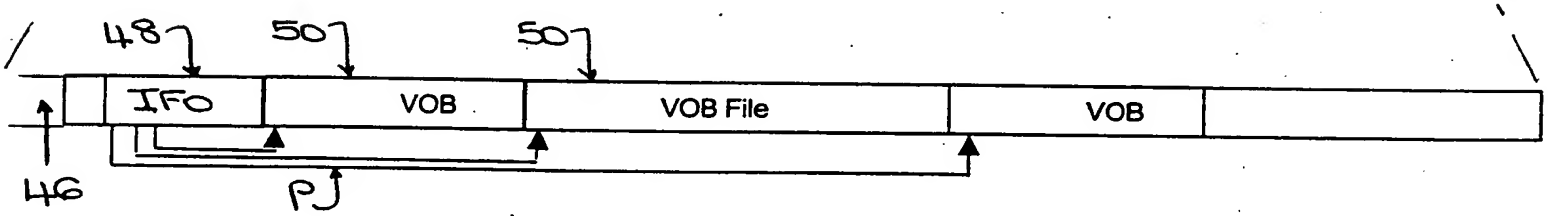

Figure 1b

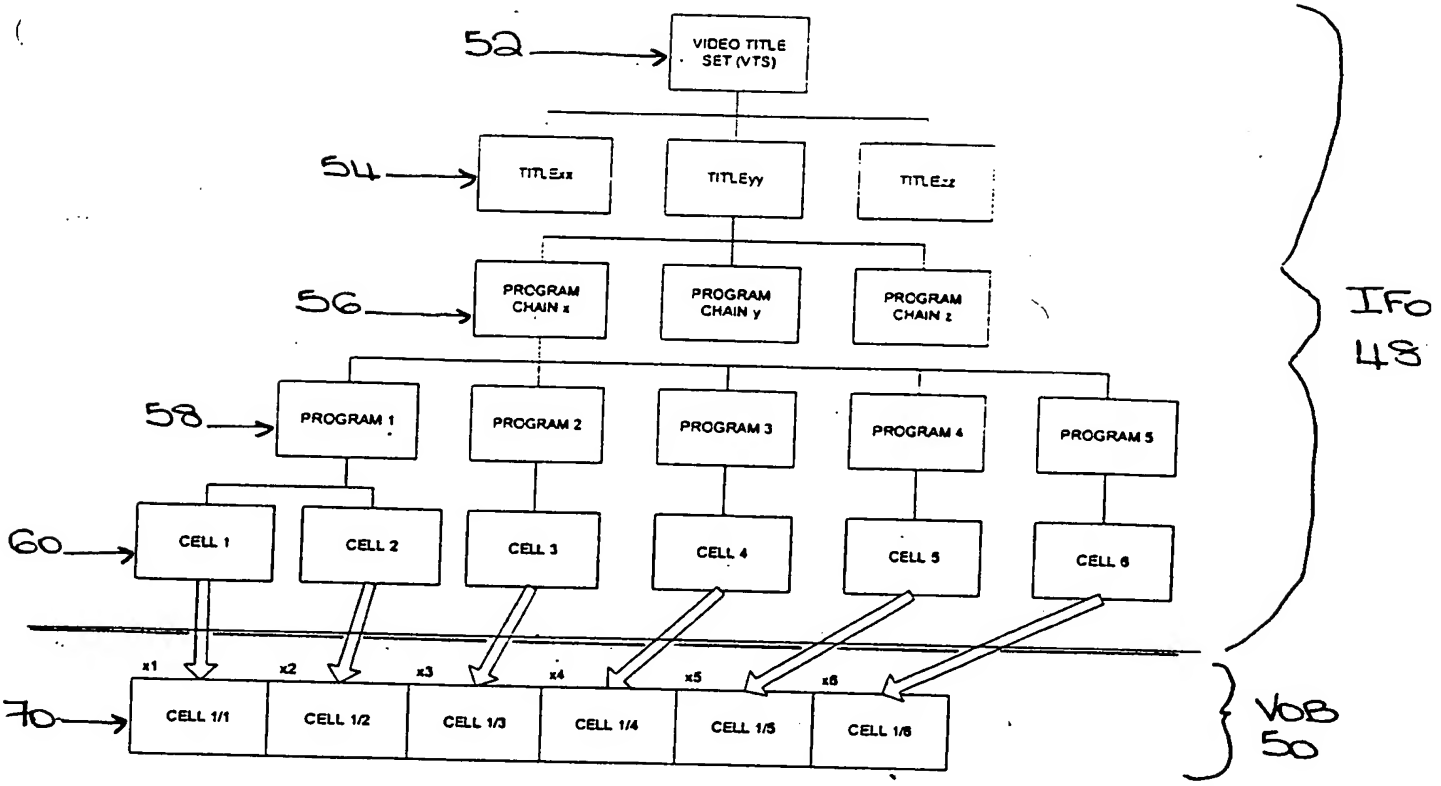

Figure 2

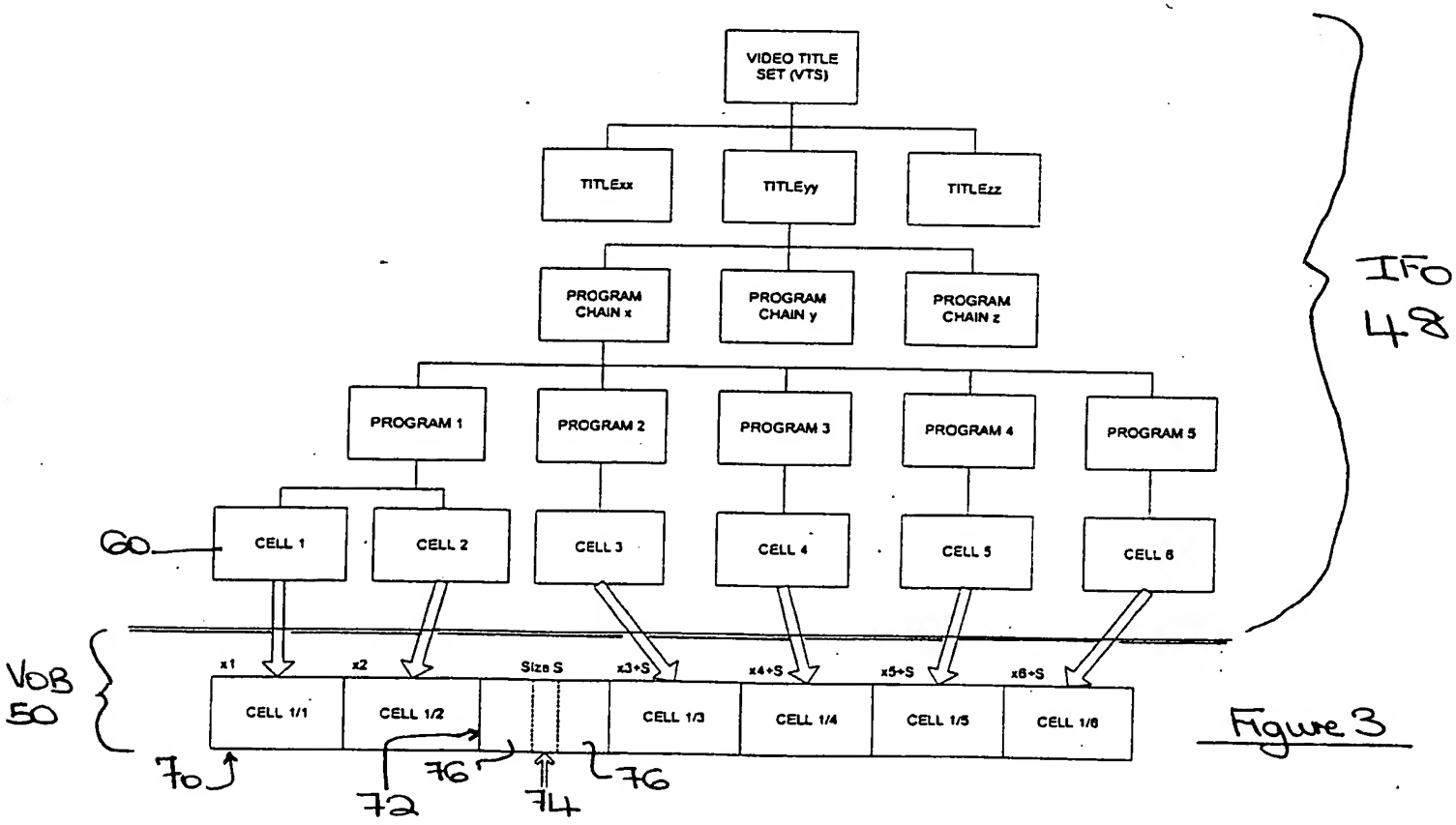

Figure 3

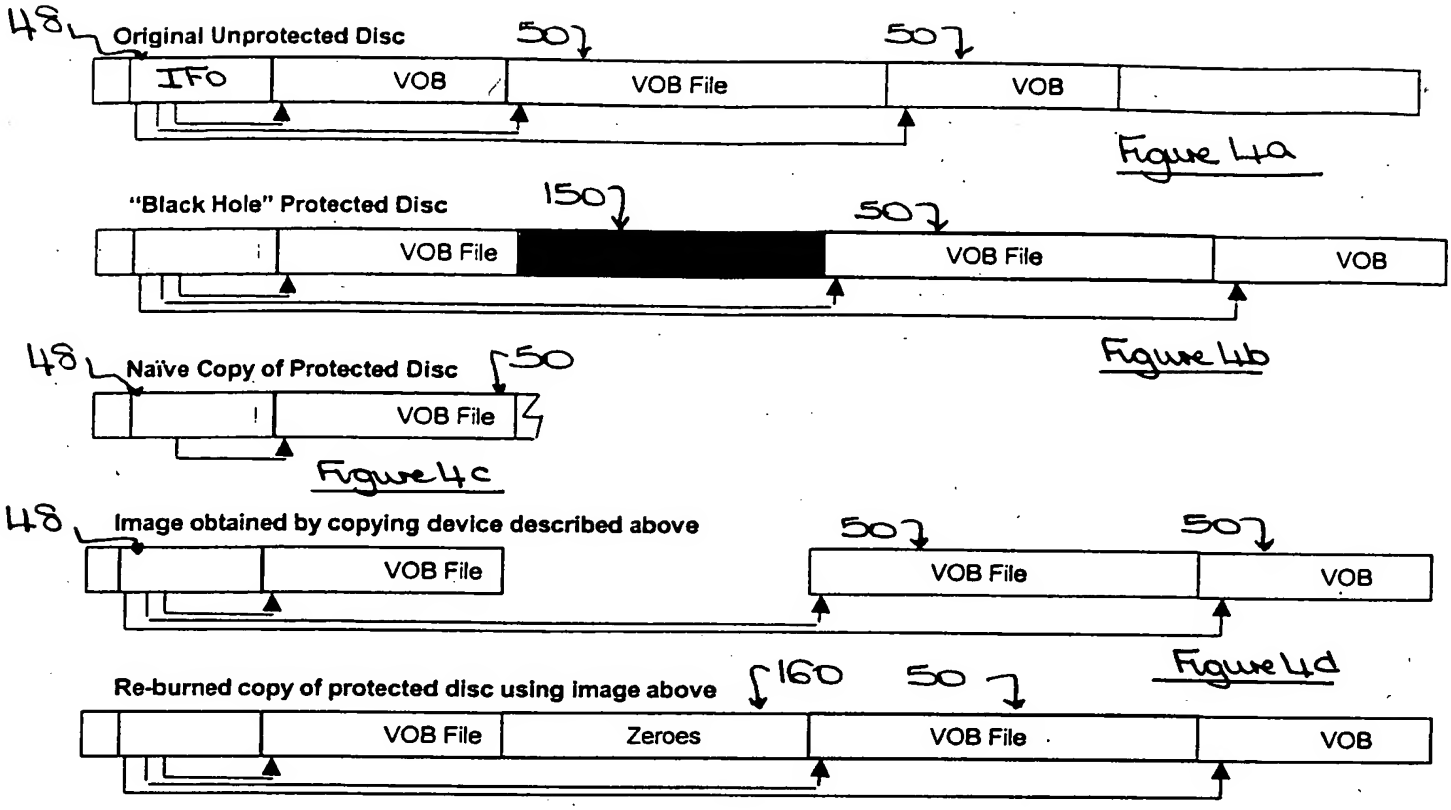

Figure 4a

Figure 4b

Figure 4c

Figure 4d

Figure 4e

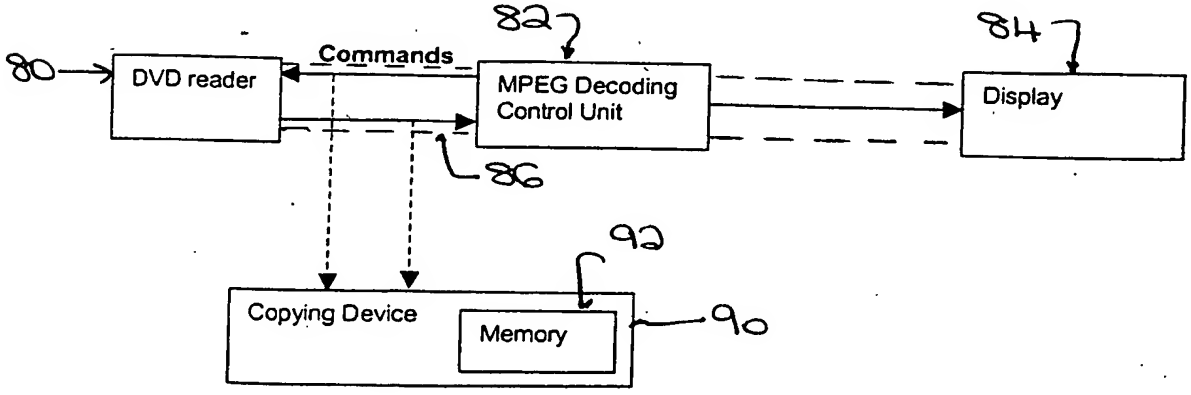

Figure 5

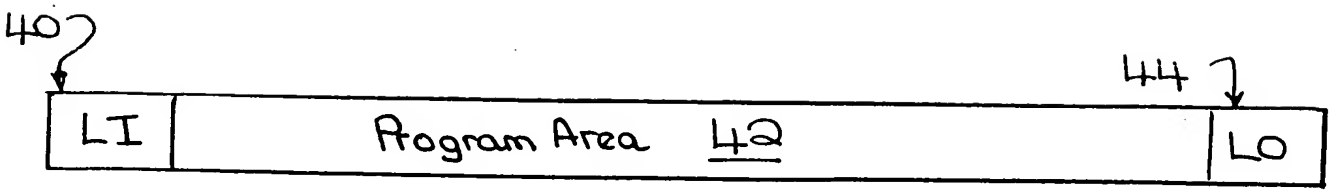

Figure 1a

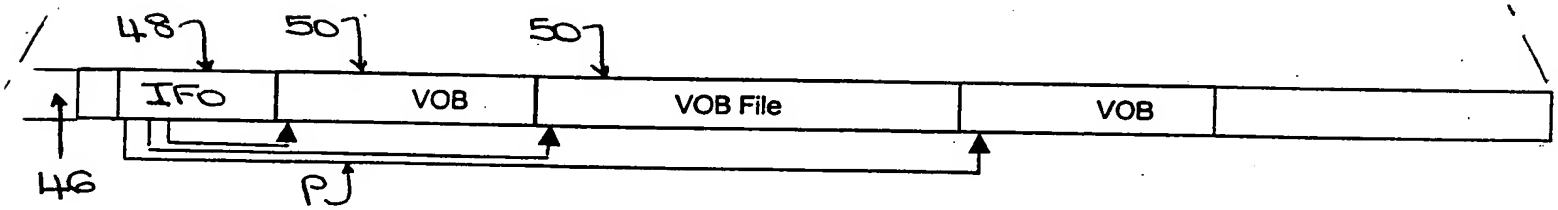

Figure 1b

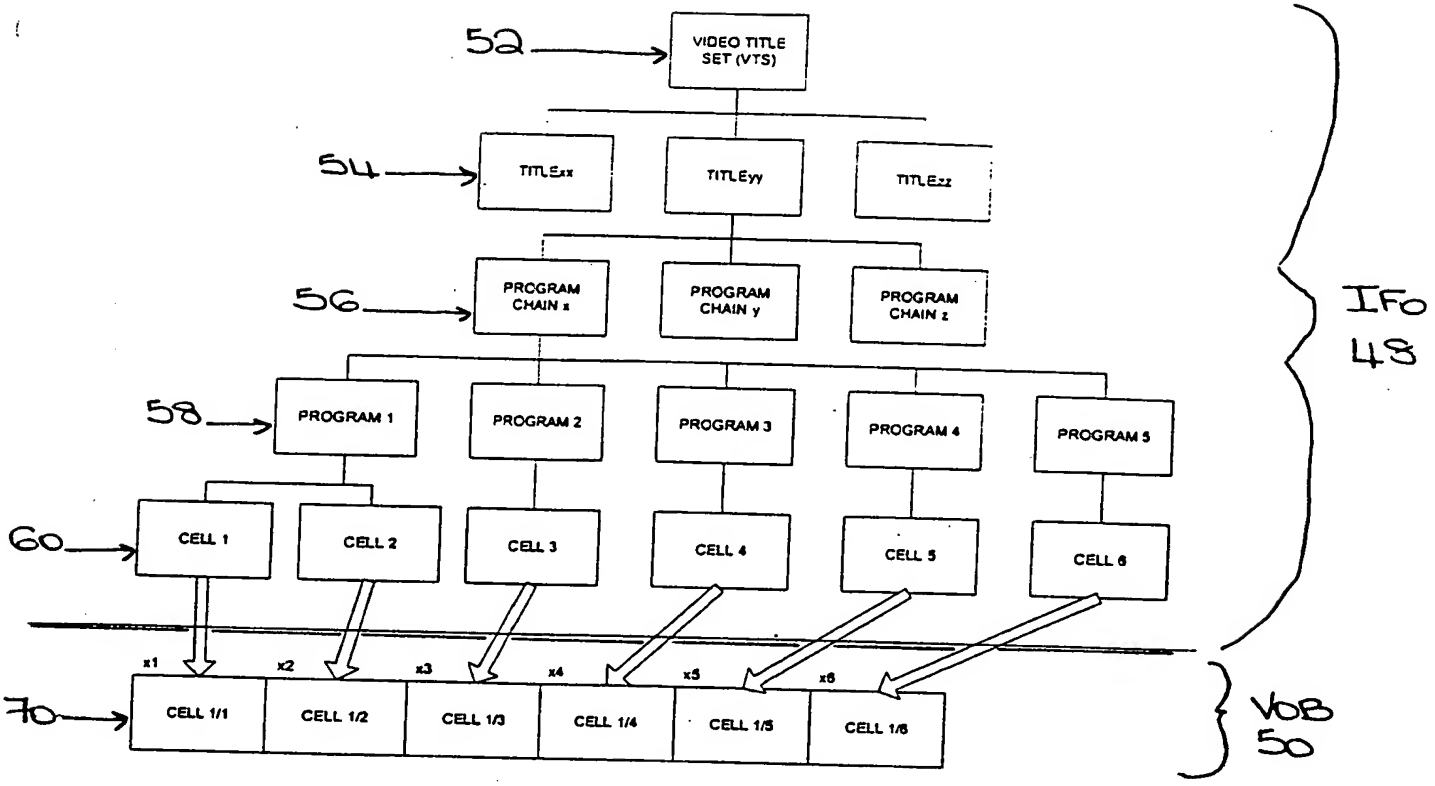

Figure 2

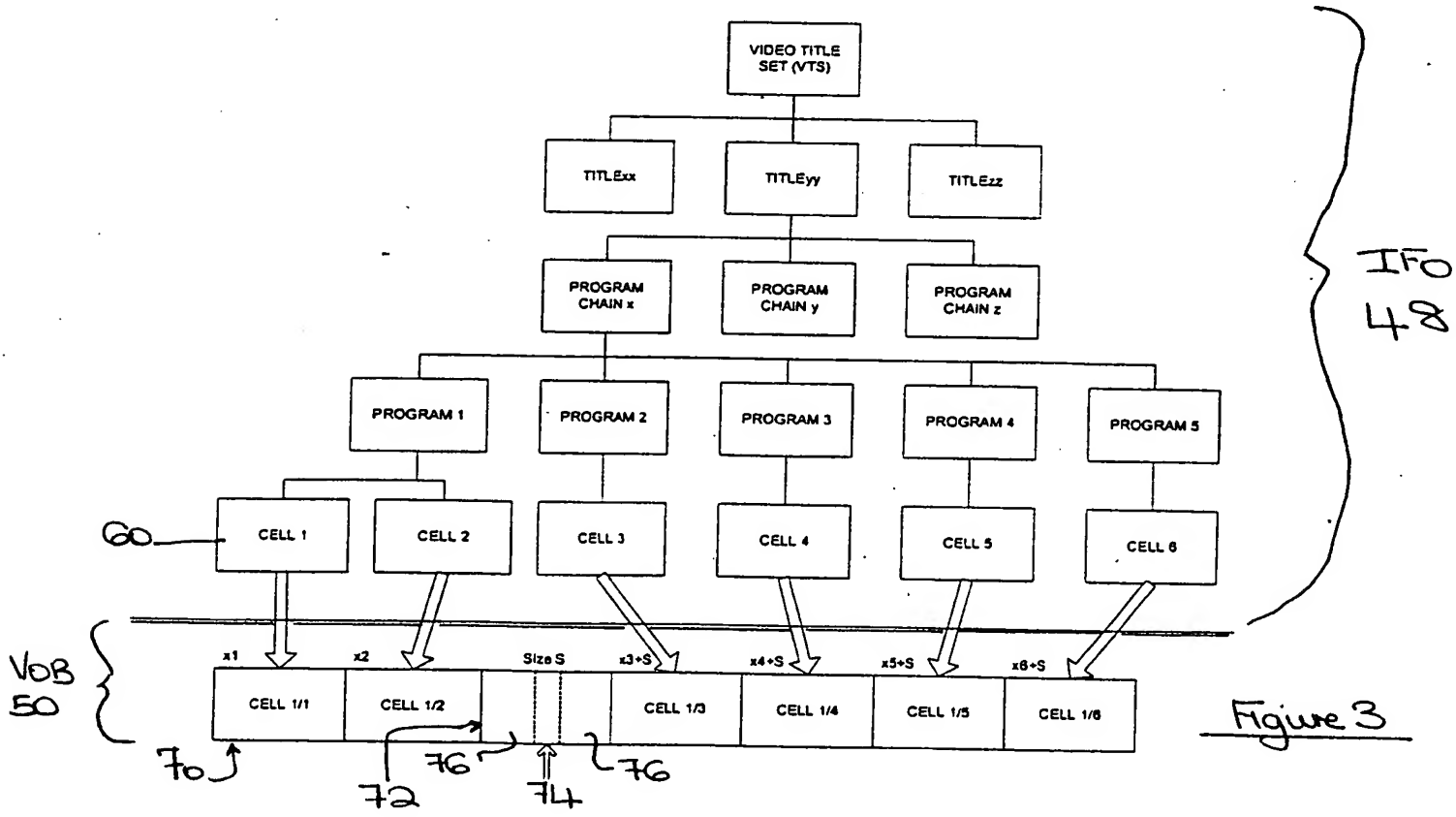

Figure 3

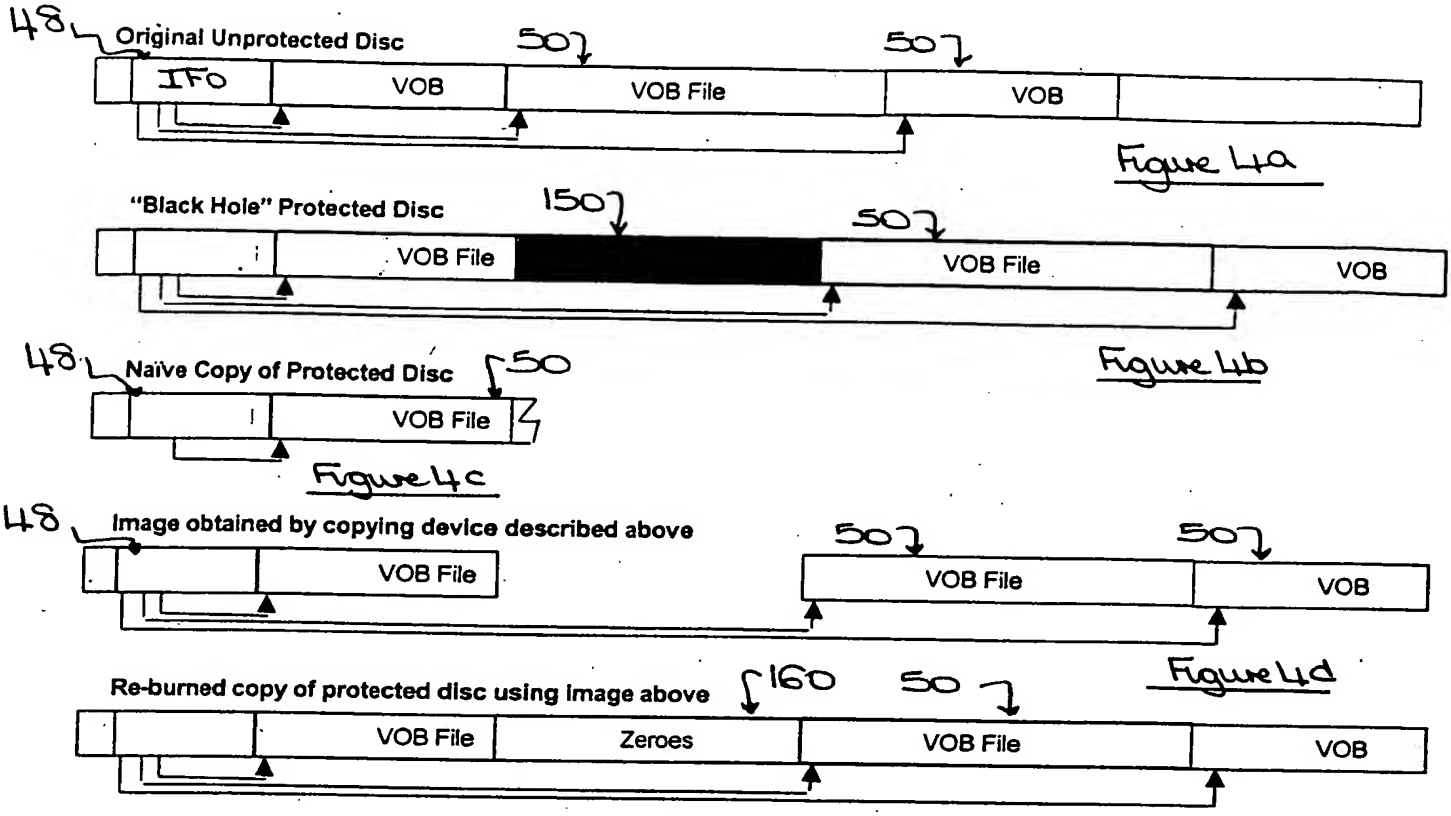

Figure 4a

Figure 4b

Figure 4c

Figure 4d

Figure 4e

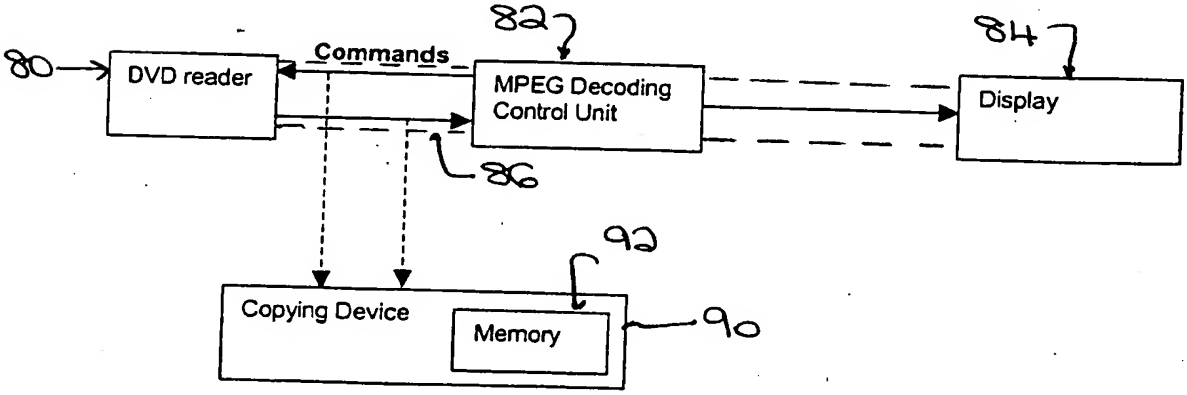

Figure 5